

***Preliminary Analysis of Hunter
Observations of Northern
Mountain Caribou in the
Mackenzie Mountains, 1991-2010***

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ABSTRACT

The northern mountain population (NMP) of woodland caribou (*Rangifer tarandus caribou*) was assessed by the Committee on Status of Endangered Wildlife in Canada (COSEWIC) as a species of special concern in 2002 and was listed as such under the federal *Species at Risk Act* (SARA) in 2004. In the preparation of a SARA management plan, demographic information on the 39 delineated caribou herds was required (Environment Canada 2011). The Bonnet Plume and Redstone are two of the larger northern mountain caribou herds residing in the Mackenzie Mountains shared by the Yukon and Northwest Territories (NWT). Survey data from these herds are lacking, however Environment and Natural Resources (ENR) has collected voluntary wildlife observation data from the Mackenzie Mountain Outfitters and clients since 1991. I used this time series observation data to explore demographic characteristics of the Bonnet Plume and Redstone herds. I found consistent differences between the two herds in the ratios of calves per 100 adult females and male:female but also surprising consistency within herds over the past 20 years.

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INTRODUCTION

The northern mountain population (NMP) of woodland caribou (*Rangifer tarandus caribou*) was assessed by the Committee on Status of Endangered Wildlife in Canada (COSEWIC) as a species of special concern in 2002 and was listed as such under the federal *Species at Risk Act* (SARA) in 2004. The Redstone and Bonnet Plume are two of the larger 39 northern mountain caribou herds delineated as the NMP (Environment Canada 2011). These two herds reside in the Mackenzie Mountains shared by the Yukon and Northwest Territories. I use the term herd for consistency with the SARA *Northern Mountain Caribou Management Plan* (Environment Canada 2011).

Environment and Natural Resources (ENR) has collected voluntary wildlife observation data from the Mackenzie Mountain Outfitters and clients since 1991. These data have been presented in the annual Mackenzie Mountain Non-Resident and Non-Resident Alien Hunter Harvest Summary Reports (see Larter and Allaire 2011 for an example). These observation data represent the only survey data of these herds. I completed a preliminary analysis to explore different demographic parameters over a 20 year time series. This report presents those findings.

METHODS

All observation data were collected during August-September of the year. Observations were provided voluntarily by the guides/clients of different guiding zones covering the entire NWT side of the Mackenzie Mountains. The number of males, females, and young-of-the-year were reported for a number of different species but for this analysis only those observations of northern mountain caribou were used. I deleted duplicate (or triplicate) observations that had been turned in by each individual in a hunting party to reduce the likelihood of animals being counted more than once. However, each observation of a group is treated as a random sample of animals drawn from a herd with replacement. An adequate number of samples with replacement should provide a reasonable estimate of the number of males, females, and calves in the herd. The similarity between mean and median values in the analysis supports this. I decided against using a bootstrapping technique to derive bars of deviation around the estimates for the current analysis.

I made two key assumptions: 1) observation data made from zones G/OT/01 and S/OT/01, would be observing caribou almost exclusively from the Bonnet Plume herd of the NMP, and 2) observation data made from zones S/OT/02, S/OT/03, S/OT/04, and S/OT/05, would be observing caribou almost exclusively from the Redstone herd of the NMP.

I calculated the ratio of calves per 100 adult females, adult females to adult males, percent calves of the total number of animals observed, and the total number of animals classified for each year for each herd.

RESULTS

Over the 20 year period (1991-2010) an average of 3,692 classifications of caribou of the Bonnet Plume herd were used to derive demographic parameters. The average ratio of calves per 100 females was 34.69 (range 28.90-45.45) and average male:female was 0.81 (range 0.54-1.41) (Table 1). For the Redstone herd over the same period, an average of 16,428 caribou classifications were used to derive demographic parameters. The average ratio of calves per 100 females was 47.48 (range 35.55-63.39) and average male:female was 0.30 (range 0.15-0.55) (Table 1). The Bonnet Plume herd had a consistently lower ratio of calves per 100 females and lower percent calves and higher male:female than the Redstone herd (Figures 2-4)

Table 1: A comparison of the ratios of calves per 100 females, males per females, and percent calves of the total number of animals observed for the Bonnet Plume and Redstone northern mountain caribou herds 1991-2010.

Bonnet Plume herd				Redstone herd			
	Ca:100 F	M:F	% calves		Ca:100 F	M:F	% calves
Mean	34.69	0.8078	16.24	Mean	47.48	0.3049	26.62
Median	32.84	0.7304	15.98	Median	46.35	0.2983	25.94
Minimum	28.90	0.5426	10.71	Minimum	35.55	0.1535	20.88
Maximum	45.45	1.4083	20.75	Maximum	63.39	0.5479	34.06

The mean annual number of caribou classifications used to derive these estimates was 3,692 from 54 different observations for Bonnet Plume and 16,428 from 88 different observations for Redstone.

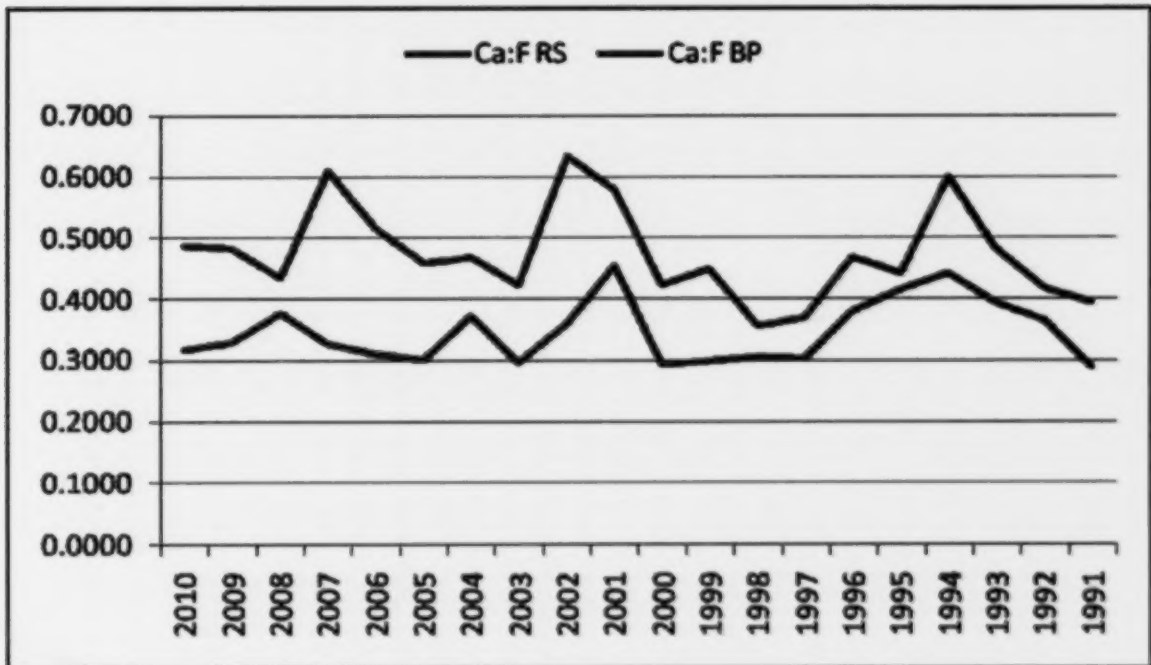


Figure 1: The ratio of calves per adult female for the Redstone (blue) and Bonnet Plume (red) caribou herds based upon fall hunter observations from 1991-2010.

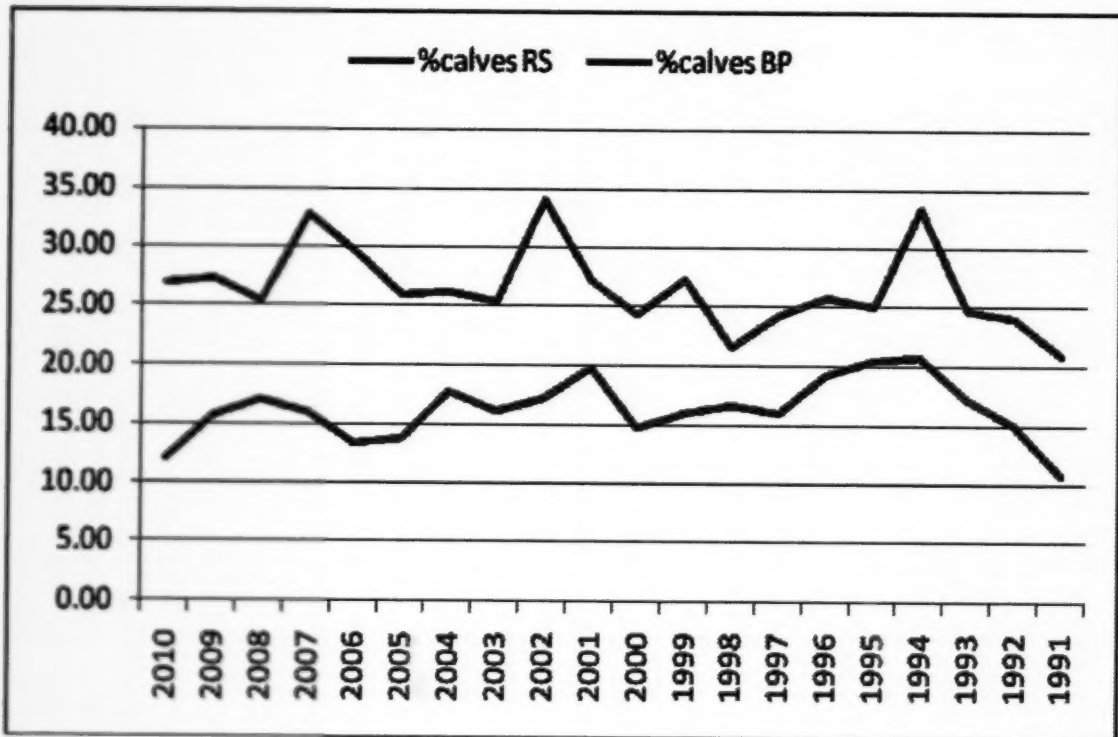


Figure 2: The percent calves of the total number of animals observed for the Redstone (blue) and Bonnet Plume (red) caribou herds based upon fall hunter observations from 1991-2010.

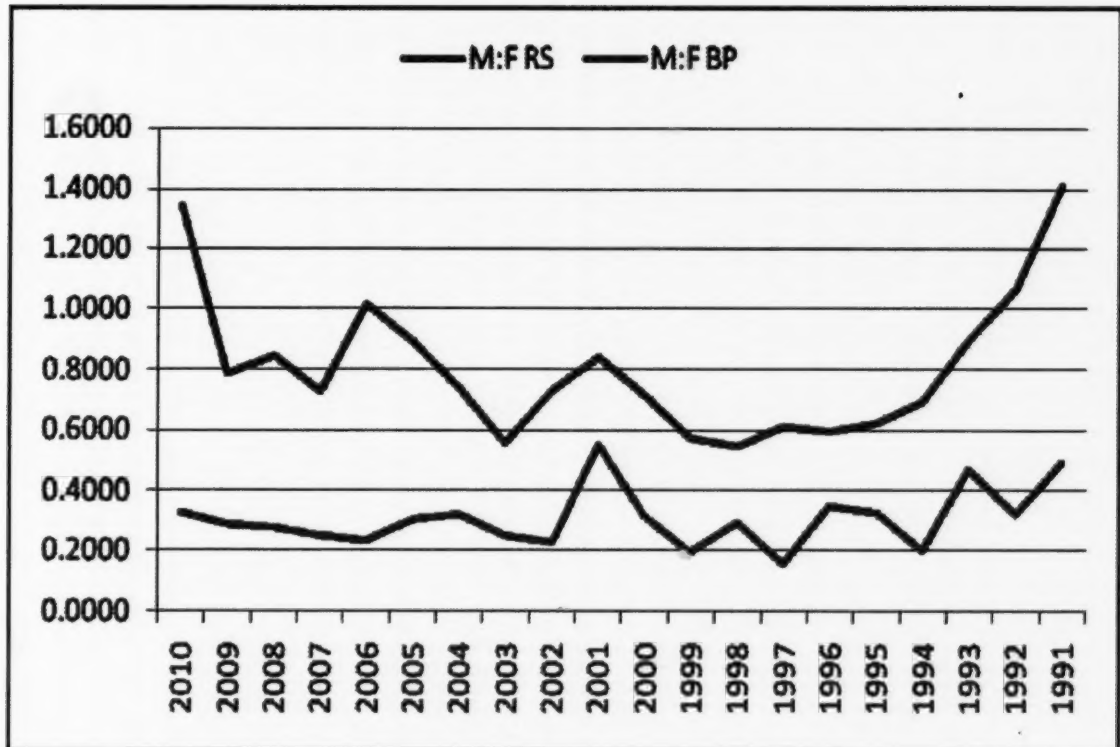


Figure 3: The ratio of males per adult female for the Redstone (blue) and Bonnet Plume (red) caribou herds based upon fall hunter observations from 1991-2010.

DISCUSSION

The ground-based hunter observation data used in this analysis has its inherent weaknesses and assumptions; however, it demonstrates how important the collection of such data over time can be. The cost of collecting such data is minimal. For species such as northern mountain caribou, that move dynamically in time and space, conducting more standard fall aerial surveys to get estimates of demographic data can not only be extremely expensive and dangerous, but also has a high probability of providing a very restricted sample from an isolated part of the range. Costs and survey weather conditions often preclude annual surveys resulting in sporadic surveys of variable quality over time.

There is the inherent underlying "bias" that ground-based hunter observation data are provided by hunters who are searching for trophy male animals to harvest and therefore they would not be interested in finding or spending time in larger more mixed sex age groups. However, it is not unusual for hunters to encounter the larger groups and they have been providing observation data from such. One would have to assume that this is consistent among the herds and the more observations making up the estimate for the year the better. On average the annual demographic parameters estimated for Bonnet Plume and Redstone herds were based upon observations from 54 different groups totaling 3,692 caribou, and 88 different groups totaling 16,428 caribou respectively (Table 1).

The best population estimates for the Bonnet Plume and Redstone herds are 5,000 and 5,000-10,000 respectively, however there is a limited basis to these estimates (Environment Canada

2011). Even though the hunter observation data are based upon observations with replacement, they indicate that the Redstone herd is certainly the larger of the two herds and likely numbers closer to the upper bound of the estimate.

It could be argued that I should not have included observation data from S/OT/01 for the Bonnet Plume analysis because some observations could have been of caribou belonging to the Redstone herd. However, including observations of Redstone caribou with the Bonnet Plume analysis should have made differences between the two herds less distinct. What this analysis shows are some differences in demographic parameters between the two herds.

Misclassifying young males as young females is also a potential weakness of the data. If this were the case both the male:female and calves per 100 adult females presented would be underestimated. It is certainly possible that some calves of the year may have been misclassified as yearlings and lumped with the adults. However, this misclassification is less likely in August and September than for winter surveys.

From 1991-1998 estimates of demographic parameters for the Redstone were derived from observations of 90-134 groups whereas for the following years it was derived from observations of fewer groups (56-95). This was because all of the outfitters were more diligent in providing and submitting voluntary observation forms during the earlier years. Whether or not this affected the results of the analysis is unknown. There does not appear to be any major difference in the demographic parameter estimates when considering the entire time series (Figures 1-3).

The sample size of groups observed for the Bonnet Plume herd in 1991 and 1992 was low: 22 and 17 groups respectively. In 1991 and 1992 the male:female ratio was at its highest and could have been a result of lower sample size (Figure 3). However, there was a high male:female ratio again in 2010, based upon observations from 57 groups.

It would be difficult to argue that the analyses of the observation data does not support the widely held belief that the Bonnet Plume and Redstone herds do show some distinct demographic differences that have been tracked over a 20 year period. There are paralleling highs and lows of the different parameters during the time series. The data also indicate that these two herds have demonstrated some consistency in parameter estimates over time regardless of what the estimated values for those estimates were. There is no indication of increase or decrease in the estimates which strongly suggests that the Bonnet Plume and Redstone herds have been relatively stable over the past 20 years.

ACKNOWLEDGMENTS

Without the voluntary observations provided by the clients, guides, and operators of the Association of Mackenzie Mountain Outfitters (AMMO) the Department of Environment and Natural Resources would have no estimates of demographic parameters for the Bonnet Plume or Redstone northern mountain caribou herds. I especially thank the members of AMMO who spent the extra time to ensure that client observations were reported and the forms forwarded to the Department of Environment and Natural Resources.

REFERENCES

Environment Canada. 2011. Management for the Northern Mountain Population of Woodland Caribou (*Rangifer tarandus caribou*) in Canada. Species at Risk Act Management Plan Series, Environment Canada, Ottawa. vii+80pp.

Larter, N.C. and Allaire, D.G. 2011. Mackenzie Mountain non-resident and non-resident alien hunter harvest summary 2010. Environment and Natural Resources Manuscript Report 211, Yellowknife, NT. 83pp.

Nagy, J.A., Johnson, D.H., Larter, N.C., Campbell, M.W., Derocher, A.E., Kelly, A., Dumont, M., Allaire, D. and Croft, B. 2011. Subpopulation structure of caribou (*Rangifer tarandus L.*) in Arctic and sub-Arctic Canada. *Ecol. Appl.* 21: 2334-2348.